Gender gap in business-related scientific research
Nemek közti szakadék az üzleti témájú tudományos kutatásokban

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Abstract

Within business-related research, publications addressing gender-specific topics are significantly underrepresented in comparison to gender-neutral studies, both in terms of quantity and scientific value. Such publications receive substantially fewer appearances and citations, achieving lower citation impact and a less significant influence. This study highlights that the underlying cause may be attributed to the low representation of women in both business and academia, which, in turn, leads to a lack of gender-specific focus within the scientific discourse.

Keywords: Business Research, Scientific Impact, Gender Inequality

JEL codes: J16, L26, M21

Absztrakt

Az üzleti kérdésekkel kapcsolatos kutatásokon belül a nemsemleges cikkekhez képest jelentősen alulreprezentált a női témakörrel foglalkozó publikációk száma és tudományos értéke. Sokkal kevesebb megjelenést és hivatkozást kapnak, továbbá alacsonyabb idézettséget és kevésbé jelentőst hatást érnek el ezek a munkák. A kutatás arra irányítja rá a figyelmet, hogy ennek eredője az üzleti életben és a tudományos világban tapasztalható alacsony női részvételi arány mellett és ennek okán is, a tudományos diskurzusban jelen lévő genderspecifikus fókuszhiány lehet.

Kulcsszavak: Üzleti kutatások, Tudományos hatás, Nemek közti egyenlőtlenség

JEL-kódok: J16, L26, M21

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1. Literature review

1.1. Disciplinary frameworks

Business activity in this research refers to activity in business that is related to management and entrepreneurial activity. In the absence of an explicit definition, women's business activity needs to be defined and understood in terms of business activity. As a consequence, it is the issues related to women leaders, women management, women entrepreneurs, women entrepreneurship that are the issues to be investigated in this topic. Women's entrepreneurship is an increasingly important issue, with a number of studies, research and academic works addressing this issue. The main reason for this is that the economic importance of women and the added value of their activities is increasingly visible in terms of concrete results and financial impacts. A few years ago, a study was carried out on the financial indicators of more than 60 000 companies in nearly 60 countries, based on 20 years of data. The results are convincing, showing that gender diversity in management increases both profits and efficiency. It was found that a 1% increase in the proportion of female managers is associated with a 15% increase in profits (Han & Noland - 2020). According to the Boston Consolting Group, women-owned businesses are 2.5 times more likely to benefit from outsourced resources, as they are able to generate a higher proportion of revenue from the capital they receive compared to male-led businesses (Fackelmann, & De Concini - 2020). Firms with female CEOs have a nearly 20% higher return on equity (Dawson, Natella & Kersley - 2016), promoting female entrepreneurship can lead to GDP benefits (Chandel & Gupta -2025), and increasing female business activity can become a key basis for an economy's resilience to crisis (Meunier, Krylova, & Ramalho - 2017). According to a study by American Express, the proportion of women entrepreneurs has more than eightfold increased in nearly half a century and now stands at over 40% (American Express - 2018), compared to nearly 30% in Europe and Hungary (European Commission - 2014). According to S&P, the share of female senior executives in the Fortune 500 ranges from 10-12% (S&P Global Market Intelligence - 2024), the share of female executives in global mid-market companies will be 33.5% in 2024 (Thornton - 2024), and according to the Hungarian Central Statistical Office (KSH), the share of women in Hungary is 47% of the total workforce and 37% of the executive workforce (KSH - 2024).

Women in business is clearly important, the importance of the topic is clearly identified, and there are studies that seriously address this issue. The question is whether such female strength in business ability is also represented in academic activity. In other words, is the research on women in business found in the resource collections in proportion to the importance of the topic, and as we will see from the analysis that it is not, the other question is what the basis for this might be. As a starting point, it would seem logical to look at the sex ratio and the composition and productivity of researchers in science. A study shows that the proportion of women in research positions is below 40%, but only 30% in research group leadership and 25% in professorships. Women receive less research funding and this has an impact on their scientific performance, and the proportion of women researchers in higher ranks of the scientific ladder is declining. (Paz & Pardo-Díaz - 2024). One study showed that male scientists publish on average 13.2 articles in their careers, while women publish only 9.6, a difference of 27%, which may affect women's scientific recognition and promotion (Lavelle - 2023). At the same time, the proportion of female authors in most disciplines has increased by less than 5 percentage points over the last decade, indicating a slow pace of change (Williamson - 2025), but it is also true that disciplines with fewer female researchers produce fewer studies on non-specific phenomena (Kozlowski et al. - 2022). The Diana Project has pointed out that male-dominated research environments have long neglected issues

related to women's entrepreneurship and found that the lack of female researchers directly influences the underrepresentation of research on women's business activities (Brush - Greene & Welter - 2020).

1.2. Science metrics gap

Having said this, the question is whether the differences seen in the previous sections will also be reflected in the evaluation and performance of scientific work, i.e. in the science metrics. One study shows that female researchers are significantly less likely to receive author recognition in scientific publications, even when their contributions are equal to those of men. This gender gap is observed in almost all disciplines and career stages (Ross et al. - 2022). The findings are confirmed by another study that analysed publication data of nearly six million researchers between 1996 and 2018 and found that men published on average 15-20% more papers than women. In addition, men are 25% more likely to be listed as last author in biomedical sciences, suggesting higher leadership roles (Boekhout, Van der Weijden, & Waltman - 2021). A larger sample size (80 million scientific articles) of publications between 1975 and 2020 in 19 disciplines found that women are significantly underrepresented in the highest ranking positions (e.g. top 10% productivity, citation and collaborative networks). It is also found that women and men achieve different levels of citation even when productivity is similar (Jaramillo et al. - 2025). For example, a study of gender differences in academic performance in the field of communication showed that papers published by women had lower values for the h-index in all countries studied, even when publication performance and citation were controlled (Horney et al. - 2024).

From the above, we can see that female authors are underrepresented, but is this approach also true for academic work on women's business activity? The citation indexes (e.g. h-index, g-index) of publications on women's entrepreneurship are generally lower than those of other business research. This is partly due to the fact that these studies often appear in smaller academic networks and are less represented in leading journals (Deng et al. - 2021). There are significant regional differences in the citation rates of research on women's entrepreneurship. Studies from developed countries tend to have higher citation rates, while studies from developing countries are often underrepresented in international academic discourse. In addition, the citation rates of non-English language publications are also lower (Goncalves, & Ahumada - 2025). Research on women's entrepreneurship often focuses on topics such as social entrepreneurship, sustainability and community impact. While these topics are important, they are often less cited than studies on technological innovation or financial performance (Kumari & Kumar - 2024). One study examines the impact of gender on the citation rates of publications in economics and management. It finds that publications by mixed-gender research teams receive more citations than articles by same-gender authors and if the corresponding author is female, this has a negative effect on citation indices, indicating underrepresentation of female-led research (Maddi & Gingras - 2020). There is an approach that sees fewer publications written by women as the primary reason for lower citation rates (Wu - 2024), and there is one that argues that research on female entrepreneurial leadership often reproduces traditional patterns and therefore appears less in high impact factor journals, which reduces their citation rates (Aparisi-Torrijo & Ribes-Giner, 2022). Unfortunately, lack of author recognition may also contribute to this, as the work of women scholars is often underestimated or attributed to others, which reduces their citation and h-index (Ghiasi, Larivière & Sugimoto - 2015). A conference presentation on the topic of gender inequality in academia suggests that there is an inherent lack of research on inequality in business schools, and that women are underrepresented among participants in the most influential forums and academic conferences. (Walters, Hassanli & Finkler - 2019) One study found that articles written by female senior researchers receive fewer citations than those written by

male senior researchers, even when they are on the same topic and of the same quality. This trend contributes to the lower h-index of female authors (Chatterjee & Werner - 2021).

1.3. Science metrics indicators

The definitions on the Publish or Perish (PoP) page clarify the science metrics used in this research. PoP software provides key metrics for evaluating research: the h-index shows the number of publications with at least that many citations; the hA-index adjusts the h-index by annual citation rates; ECC (Annual Citation Count) is the average yearly citations per paper; Cites_Year gives the annual average of all citations, Cites_Author measures citations per author, and Cites_Paper is the average citations per publication. These metrics offer a clear view of scientific impact (Adams, 2016).

2. Methodology

Data were extracted for the study directly using the Google Scholar interface and by downloading the Publish or Perish (PoP) software between March and May 2025. Using the software, in addition to the publication period (year of publication), it was also possible to set up underlying search interfaces. Open Alex and Scopus hits were found to be analysable, so the study uses these as a basis for making findings on different item counts. The data were first compiled using Excel and then analysed using IBM SPSS and Python software. The analysis consists of basic statistics and correlation analysis. The aim of the research was to explore gender differences in scientific publications, moving from general findings to specific correlations, with a particular focus on identifying drivers and indicators.

3. Results

3.1. Basis of investigation

A high-level view of research on women's business activity is shown in Table 1. The search keywords were entered in the Google Scholar interface without adjusting the publication year or other filters. The results are as follows. For the term "entrepreneurs" there are approximately 4.45 million hits, while for "women entrepreneurs" there are only 1.89 million hits. For the keyword "leadership" there are more than 5.48 million hits, while "female leadership" has 3.63 million hits. There is also a significant difference between "entrepreneurship" and "female entrepreneurship": 3.47 million vs. 969,000. Overall, the five generic keywords received more than 25 million hits , with the addition of the female keywords reducing the number of hits to under 16 million, a change of 62.57%.

1. Table 1: Number and proportion of Google Scholar search keywords found

Search	Number of hits from large (pcs)	Female Percentage found (%)
business	5 360 000	89,93%
women business	4 820 000	
leaders	6 570 000	69,10%
women leaders	4 540 000	
leadership	5 480 000	66,24%
female leadership	3 630 000	
entrepreneurs	4 450 000	42,47%
women entrepreneurs	1 890 000	
entrepreneurship	3 470 000	27,93%
female entrepreneurship	969 000	

Source: own edit, based on search data 01.05.2025, (n= ~41 179 000)

As can be seen from the above, the proportion of publications dealing specifically with women is under-represented for all search keywords in relation to the general search keywords, to varying degrees. This suggests that women's roles in business in academic discourse receive far less attention than their gender-neutral approach. There may be very simple reasons for this phenomenon. On the one hand, the female dimension is only a sub-theme for the different topics, so it is quite understandable that there are fewer hits for non-specific keywords. On the other hand, it is also true that women are under-represented in both the entrepreneurial and managerial population (i.e. in business) and in academia, which may result in a lower number of publications dealing with them. These hypotheses are neither confirmed nor refuted in the current research, as the focus of the study is on whether there are other correlations besides the three general findings that could explain the gender gap in publications. Therefore, the research focuses on the explanatory hypothesis that there may be an under-representation of academic interest and activity in publications and research on women's business activity.

3.2. Scientometric field

The underrepresentation of academic interest and activity in women's business-related publications and research was investigated using data extracted from the Publish or Perish app made available by Anne-Will Harzing. The application showed the top 200 to 1000 publications in each case. The keywords, search interfaces and item numbers used were searched as shown in Figure 1.

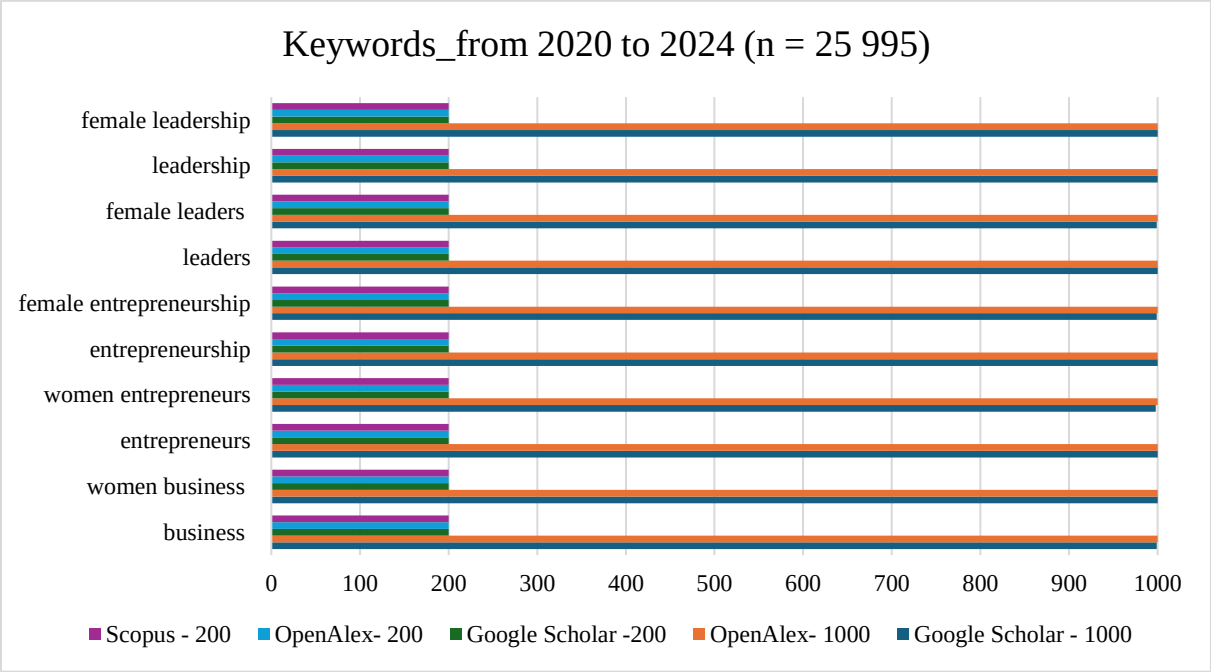


Figure 1: Research sample examined, *Source: own editing based on Publish or Perish*

As a first step, it was important to identify what the variation in the patterns implied in terms of the specificity of the results. In all cases, the 200 samples produce higher Cites_Paper values, i.e. the best articles are actually selected. In the 1000 samples, the total citation size increases, but the citation per article decreases. Open Alex leads the Cites_Paper indicator everywhere by a wide margin - it is more selective or has a better weighting. scores lowest in almost all cases - due to lower coverage or different filtering logic.

Female keywords generally have lower citation rates, so a comparative analysis was made for the five keywords (business, entrepreneurs, entrepreneurship, leadership and leaders) in their general and female versions (e.g. business vs. women business, "entrepreneurs vs. women entrepreneurs). For ease of visualisation, different sample sizes (200 and 1000) were aggregated for a keyword and search engine, averaged by citation per article, citations and h-index. The result is shown in Table 2.

Table 2: Relative differences between the values of general and female search terms

Relative	**Cites_Paper (%)**			**Reference (%)**			**hA-index (%)**		
Topic/ Search engine	**GS**	**OA**	**SC**	**GS**	**OA**	**SC**	**GS**	**OA**	**SC**
Business	-39,22	-54,42	-89,94	17,38	-56,34	-89,94	-17,53	-37,00	-77,23
Entrepreneurs	-46,24	-51,75	-69,82	-35,87	-52,91	-69,82	-36,13	-40,11	-53,33
Entrepreneurship	-29,38	-61,86	-79,20	-2,64	-61,64	-79,20	-26,52	-43,21	-60,00
Leaders	9,61	-58,63	-66,93	21,56	-59,24	-66,94	-4,86	-40,26	-52,24
Leadership	-26,65	-51,35	-62,07	17,74	-52,97	-62,07	-12,84	-34,59	-51,43

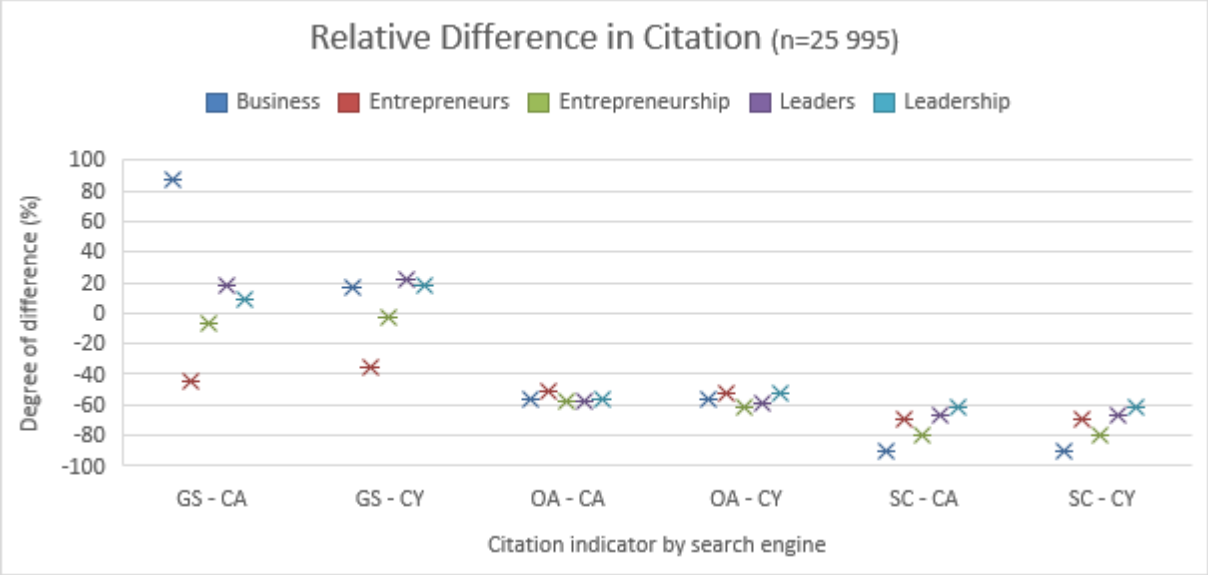
GS: Google Scholar, OA: Open Alex, SC: Scopus

Source: own editing based on Publish or Perish, (n = 25 995)

Based on the above, the following conclusions can be drawn:

- **Cites_Paper - Citations per article:** across all search engines, there is a negative bias for almost all topics, with articles found for female keywords receiving fewer citations on average. Scopus usually shows the largest drop, e.g. in "Business" almost 90% lower citations for female keywords, but Open Alex also shows a significant drop of between 50-60% in all topics. Google Scholar shows a slight difference in some cases, and for "Leaders" the female keyword is 9.61% better. These results confirm that the focus of scientific discourse is mainly on general (not non-specific) publications.
- **Number of citations - Total citation volume:** there is a decrease in most topics, but not as drastic as for Cites_Paper. Google Scholar shows a positive difference for several topics, i.e. female keyword searches received more citations overall. This suggests that while the citation volume of articles (Cites_Paper) is lower, the publication volume is higher for female topics. However, Open Alex and Scopus consistently give lower values. This shows that female topics produce many articles, but their citation counts are often concentrated, so the volume does not always show as much of a disadvantage as the average citation count.
- **hA-index - Effectiveness (h-index alternative):** the hA-index is the most sensitive indicator. The most sensitive indicator is the h-index. Again, the largest difference is seen in Scopus ("Business" - 77.23%), while the smallest difference ("Leaders": -4.86%) is seen in Google Scholar results. It follows that a lower proportion of publications for female keywords are included in the highest impact articles.

In addition to these three important indicators, it is worth adding two more to the comparison. For Cites_Year - annual citations and Cites_Author - citations per author, the extent of the differences by search interface for the keyword pairs (female and general) is shown in Figure 2.



GS: Google Scholar, OA: Open Alex, SC: Scopus, CA: Cites_Author, CY: Cites_Year

Figure 2: Relative difference in citation rates, *Source: own editing based on Publish or Perish*

"Entrepreneurship" shows consistently negative values in all databases, so female-written research is underrepresented in citations. The keyword "Business" is the most shared topic. Scopus and Open Alex show a high gender keyword gap, but Google Scholar shows a more positive picture. For "Leaders", the differences are the most even, with some positive differences on Google Scholar and a slight disadvantage on other platforms. Leadership" and "Entrepreneurs" show a mixed picture, but the overall effect is also rather negative. The use of female keywords results in negative citation rates on most academic search engines. This disadvantage appears to be systemic for Open Alex and Scopus, while Google Scholar shows a more balanced pattern. The results suggest that the choice of gender-neutral versus female keywords may have an impact on the scientific metrics of publications.

A correlation test was used to check whether the scientific impact or success of a publication is related to the fact that it deals with a female topic. The presence of a female subject was treated as a binary variable in the model (1 - female keyword; 0 - general keyword) and the correlation of the 1 - 0 code with various science metrics was investigated. The results are shown in Table 3.

Table 3: Relative differences between the values of general and female search terms

Metrics	Measurement basis	Correlation indicators
hA-index	Authorship scientific impact - takes better account of authorship sharing and collaboration	r = -0.45, p < 0.001
ECC	Co-citation - how many times the same article is cited with other cited articles	r = -0.40, p < 0.01
Cites_Year	Annual citation (current effectiveness indicator)	r = -0.38, p < 0.01
Cites_Author	Quotes per author	r = -0.34, p < 0.01
h_index	Classic impact indicator: a researcher has at least *h* articles cited at least h *times*	r = -0.31, p < 0.05
Cites_Paper	Number of citations per publication	r = -0.29, p < 0.05

Source: own editing based on Publish or Perish, (n = 25 995)

Based on the results of the study , the science metrics of research on women's keywords lag behind general (non-specific) topics in several respects. Researchers related to female topics tend to have a lower scientific impact, as indicated by lower hA index values. Publications on female topics are less linked to other scientific papers, i.e. they appear less often in the co-citation context of other articles, resulting in lower ECC scores. Articles containing female keywords are cited fewer times per year, suggesting that their current impact is also more limited (Cites_Year). Nevertheless, it can be seen that there are typically fewer citations per author, which is reflected in the Cites_Author value, and that authors of female keyword publications have fewer highly cited papers, as indicated by the lower h-index value. Overall, articles with female keywords are also less cited at the article level, as indicated by lower Cites_Paper values.

The study was interested in an effect over time. Due to the "permissiveness" of Google Scholar and the "strictness" of Scopus, only Open Alex search keywords were examined using the Publish or Perish interface and only for female keywords. These were "Women Business; Women Entrepreneurs; Female Entrepreneurship; Female Leaders; Female Leadership". The queries were broken down into 5 5-year cycles of publications between 2000 and 2024. The study looked at how research on female keywords published in different periods performed in terms of scientific impact and citation. Each of the keywords was examined, but the results for the five keywords are shown together in Figure 3. In

order to detect them together, two steps were necessary. The different keywords were grouped by time intervals and their respective science metrics were averaged. Visual representability required that the Cites_Author values should take the tens of thousands, the Cites_Year values the hundreds, and the Cites_Paper and h_index values the tens of orders of magnitude lower, while leaving the hA index values unchanged.

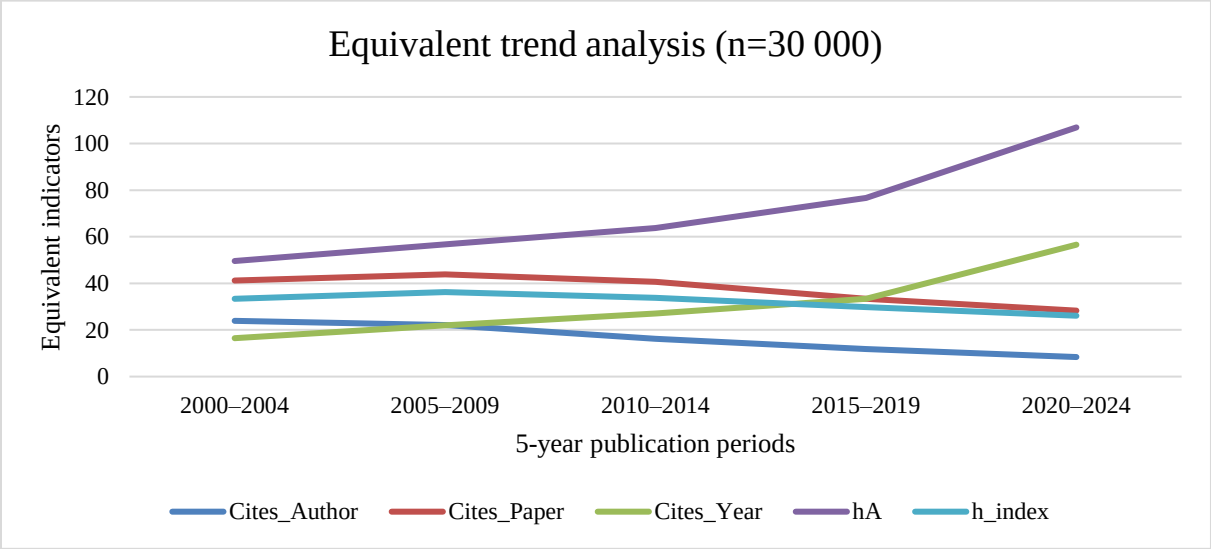


Figure 3: Time impact of keywords, *Source: own editing based on Publish or Perish*

A combined view of the results shows that the most recent research on women (2020-2024) has a high annual citation rate (Cites_Year), but still receives fewer citations per author or article, which may be due to the topicality of the research focus. Cites_Paper and Cites_Author decrease for more recent publications, i.e. on average fewer citations per article or author than for older publications. This means that more recent articles have an even smaller impact, which is understandable as they have been published less recently, and this approach is supported by the h-index values. However, the alternative impact index (hA) is dynamically increasing , indicating that the scientific weight of female keywords may increase in the near future, as they are generating an increasingly active and strong research community impact . Overall, therefore, it can be said that recent research has a high annual citation rate, but on average even fewer citations per article and per author, as it is recent and has been available for a shorter period of time. However, the increase in the alternative impact indicator (hA) suggests that these publications are having an increasing scientific and community impact.

4. Discussion

4.1. Findings

Based on the investigations carried out, the following summary findings can be made:

1. Underrepresented in the proportion of publications dealing specifically with women compared to general search keywords: women's roles in business receive far less attention in academic discourse than their gender-neutral approach.
2. On average, articles found for female keywords receive fewer citations: the focus of scientific discourse is mainly on general (not non-specific) publications.

3. Citation rates for articles found for female keywords are lower, publication volumes are higher for female topics: female topics produce many articles, but their citations are often concentrated, so the volume is not always as large a disadvantage as the average citation.
4. Articles found for female keywords in almost all subjects and search engines show significantly lower scores than female keywords for the hA index: a lower proportion of publications for female keywords are included among the most influential articles.
5. The use of female keywords is also a disadvantage for annual citations and citations per author: the choice of gender-neutral versus female keywords can affect the scientific metric evaluation of publications.
6. Women's topics and publications have lower scientific impact, fewer links to other scientific work, fewer citations per year and fewer highly cited papers: the science metrics of research on women's keywords lag behind general (non-specific) topics in several respects.
7. However, the alternative impact indicator (hA) based on the temporal analysis of women's topics is dynamically increasing: the scientific weight of women's keywords may increase in the near future, as they trigger an increasingly active and strong research community impact.

5. Summary

The theoretical background research showed that although the importance and economic value of women's business activity is significant, women are underrepresented in the boardrooms of companies and in the population of businesses. In addition, the participation of women in science and the proportion of research on women in business is low. Possible explanations for this could include a scientific gender gap driven by a lack of interest, in addition to the proportion of women in the female managerial and entrepreneurial and female researcher populations. The empirical study confirmed that not only quantitative differences and sub-topic differences can be found in the lower number of academic publications on female entrepreneurship, but also qualitative differences emerge. Articles on women in business have lower citations, fewer citations and less impact compared to their non-neutral counterparts on the same topics.

5.1. Further research directions

Without being exhaustive, further directions for research on the science metrics approach to women in business could be:

- Are there region- or journal-specific differences in the science metrics of research on women's business activity?
- What are the specific correlations between the proportion of female researchers and the science metrics of publications on women in business?
- What are the specific correlations between the level of female business activity (proportion of managers and entrepreneurs) and the scientific metrics of publications on female business activity?
- How and to which economic indicators could the value of the science metrics seen in women's business activity, its variations and changes be related?

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